January Safety Topic of the Month

Nitrogen Hazards and CSB video (12 minutes)

Richmond Refinery

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Nitrogen Hazard: The inert environment

In Delaware City, DE, on November 5, 2005 a Valero Refinery suffered two boilermaker fatalities involving the treatment of confined spaces and work near an inert environment.

This Safety Topic of the Month was created to raise our awareness of the dangers of an inert environment specifically caused by the use of nitrogen for equipment purging or cleaning in a Refinery setting.

Please use this time to take a closer look at how you treat inert environments during your work day. SEE THE HAZARD and prevent a similar scenario here.

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Chemical Safety Board Video

Please select the link below to view the Chemical Safety Board video (12 minutes).

Hazards of Nitrogen Asphyxiation

Thought Provokers:

- *When does a fresh air job begin?*
- *Where does an inert atmosphere end?*

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What are the consequences of an inert environment?

Table 1. Effects of oxygen deficiency on the human body.

Percent Oxygen	Physiological Symptoms
23.5	Maximum "safe level'
21	Typical oxygen concentration in air
19.5	Minimum safe level
15 - 19	First sign of hypoxia. Decreased ability to work strenuously. May induce symptoms in persons with heart, lung, or circulatory problems
12 - 15	Respiration increases with exertion, pulse up, impaired muscular coordination, perception, and judgment
10 - 12	Respiration further increases in rate and depth, poor judgment, blue lips
8 - 10	Mental failure, fainting, unconsciousness, ashen face, blue lips, nausea, vomiting, inability to move freely
6 - 8	Six minutes–50% probability of death Eight minutes–100% probability of death
< 6	Coma in 40 seconds, followed by convulsions, respiration ceases, death

Source: *Hazards of Nitrogen and Catalyst Handling*, Institution of Chemical Engineers, 2004

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What other dangers do confined spaces pose?

Any boiler, tunnel, well, silo, shaft or poorly ventilated crawl space can be a potentially dangerous confined space.

Even if your job doesn't involve entering a confined space; if there is one nearby, it is important to be aware of the dangers. One hazard in such spaces is an oxygen level below what is needed to sustain life.

Confined space entry is not something to be undertaken lightly. It requires training, protective equipment, correct procedures and authorization. Even in an emergency, you have to follow all precautions.

About half of the confined space fatality victims are rescuers. The chain of events repeats: Somebody gets into trouble in a confined space and someone else rushes in without using a proper respirator. Then two people are down. There have been cases of one rescuer after another dying in a confined space.

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Confined Space

There are common procedures for confined space entry, including:

- Getting a written entry permit.
- Assembling tools such as personal protective equipment (PPE), lifeline, retrieval harness, testing devices, lighting and communications equipment.
- Preventing pedestrians or vehicles from entering the work area.
- Testing the air for dangerous gases and lack of oxygen.
- Isolating electrical hazards and closing off lines of flowing liquids or solids.
- Ventilating the area or purging it with inert gas that can't explode. Inert gas can cause oxygen deficiency. Don't use pure oxygen because of the danger of explosion.
- Wearing proper PPE.
- Posting an attendant outside the confined space.
- Removing possible sources of ignition and using non-sparking tools and lighting.

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